REMARKS

This is a full and timely response to the non-final Official Action mailed June 8, 2007 (the "Office Action" or the "Action"). Reconsideration of the application in light of the following remarks is respectfully requested.

Claim Status:

Claims 29-46 were withdrawn from consideration under a previous Restriction Requirement and cancelled without prejudice or disclaimer. Additionally, claim 27 has been cancelled without prejudice or disclaimer.

By the present paper, various claims are amended. No claims have been added or cancelled. Thus, claims 1-26, 28 and 47-60 are pending for further action.

Objection to Specification:

The Action objected to claim 2 for a minor informality. The minor informality in claim 2 has been corrected herein.

The Action also objected to originally-filed claims 15 and 18 as not having sufficient antecedent basis in the specification. While Applicant respectfully disagrees, the language of claims 15 and 18 has been added to the specification at paragraph 0047 to ensure proper antecedent basis. Because claims 15 and 18 are originally-filed claims, no new matter is added by this amendment to paragraph 0047.

Following entry of this amendment, the objection to the specification should be reconsidered and withdrawn.

35 U.S.C. § 112, second paragraph:

In the recent Office Action, claims 15-20, 48 and 49 were rejected under 35 U.S.C. § 112, second paragraph. Specifically, the recitation of "said deposits" in claim 15 allegedly lacked antecedent basis.

While Applicant does not necessarily agree that claim 15 was indefinite as filed, claim 15 been amended herein to address the issue raised by the Examiner under 35 U.S.C. § 112, second paragraph. Following this amendment, all the remaining claims are believed to be in compliance with 35 U.S.C. § 112 and notice to that effect is respectfully requested.

Prior Art:

Claims 1-6, 9-14 and 47 were rejected as being unpatentable under 35 U.S.C. § 103(a) over U.S. Patent No. 5,997,795 to Danforth et al. ("Danforth"). For at least the following reasons, this rejection is respectfully traversed.

Claim 1 recites

> A method for producing porous structures in a three-dimensional object with solid freeform fabrication comprising:
>
> in a solid freeform fabrication device having a fabrication bin, selectively depositing a removable support material at selected locations within said fabrication bin in a pattern corresponding to pores desired in a layer of said porous structure of said object;
>
> in said fabrication bin, depositing a liquid, curable build material around said removable support material, said support material defining a shape of at least a layer of said three-dimensional object formed with said build material; and
>
> *removing said selectively deposited removable support material to form said pores within said three-dimensional object so as to control a porosity of said build material of said object.*

(Emphasis added).

Support for the amendment to claim 1 can be found in Applicant's originally filed specification at, for example, paragraphs 0029 and 42. In contrast, Danforth does not teach or suggest the claimed method including "removing said selectively deposited removable support material to form said pores within said three-dimensional object so as to control a porosity of said build material of said object."

Danforth teaches using solid freeform fabrication to make a mold for a photonic bandgap structure. (Danforth, abstract). As shown in Fig. 6 of Danforth, materials (60, 66) are deposited to form a mold (200) that includes relatively large cavities in which the desired photonic bandgap structure is then molded. "Once mold 200 has been completed, the cavities within the mold may be filled with a slurry for forming the photonic bandgap device." (Danforth, col. 23, lines 6-8). "Mold 200 is configured to yield a photonic bandgap device consisting of rods of circular cross-section extending parallel to one another in the Z direction, with a periodic separation distance b defining an air gap between them." (Danforth, col. 5, lines 48-50).

The Office Action has not explained how this teaching is relevant to the claimed method that produces "pores" in an object being fabricated. A "pore" is defined as "a minute opening ... [e.g.] one by which matter passes through a membrane." (http://www.m-w.com/cgi-bin/dictionary)." Consequently, it would unreasonable to attempt to construe the cavities taught by Danforth for molding rods of a photonic bandgap device as "pores."

Moreover, Danforth's teaching clearly do not include a method able to "control a porosity of said build material of said object."

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present instance, the scope and content of the prior art, as evidenced by Danforth, did not include the claimed method including "removing said selectively deposited removable support material to form said pores within said three-dimensional object so as to control a porosity of said build material of said object." This subject matter appears to be entirely beyond the scope of the cited prior art.

Moreover, this difference between the cited prior art and the claimed subject matter is extremely significant. As explained in Applicant's specification, the claimed method allows the selective control of the porosity of the build material after it is deposited and solidified. (Applicant's specification, paragraph 0029 and 42). This advantage is apparently unknown and unavailable in the prior art.

For at least these reasons, Danforth cannot support a rejection of claim 1 under 35 U.S.C. § 103(a) and *Graham*. Therefore, the rejection of claim 1 and its dependent claims should be reconsidered and withdrawn.

Additionally, the various dependent claims of claim 1 recite subject matter that is further patentable over Danforth. Specific, non-exclusive examples follow.

Claim 9 recites "wherein said selectively depositing a removable support material comprises depositing said removable support material with a high-precision dispenser and wherein said depositing a build material comprises depositing said build material with a low-precision dispenser." In contrast, Danforth does not teach or suggest such a distinction between a high precision material dispenser and a lower precision material dispenser. For at least this additional reason, the rejection of claim 9 should be reconsidered and withdrawn.

Claim 47 recites "wherein said build material and said removable support material are dispensed together as a moving stage traverses said fabrication bin." The Action does not indicate how or where this subject matter is taught by Danforth. For at least this additional reason, the rejection of claim 47 should be reconsidered and withdrawn.

Claims 7, 8 and 50-60 were rejected as being unpatentable under 35 U.S.C. § 103(a) over U.S. Patent No. 5,997,795 to Danforth et al. ("Danforth"). For at least the following reasons, this rejection is respectfully traversed.

Claim 7 now recites:

> A method for producing porous structures in a three-dimensional object with solid freeform fabrication comprising:
> selectively depositing a removable support material;
> depositing a build material defining said three-dimensional object; and
> removing said selectively deposited removable support material to form a number of pores within said three-dimensional object; and
> *infiltrating said pores with a property enhancing material that enhances a property of said object.*

(Emphasis added).

Support for the amendment to claim 7 can be found in Applicant's originally filed disclosure at, for example, paragraph 0040.

In contrast, Danforth does not teach or suggest this claimed method, particularly, creating pores using a removable support material during solid freeform fabrication of an object and "infiltrating said pores with a property enhancing material that enhances a property of said object." Rather, as indicated above, Danforth teaches using solid freeform fabrication to make a mold for a photonic bandgap structure. (Danforth, abstract).

As cited in the Office Action, Danforth teaches that

> one or more thermoplastic materials are held in heated reservoirs associated with a printing head or nozzle. The layering signals from the CAD-based software control the movement and actuation of the printing head which dispenses droplets of the materials in liquid form onto a substrate. The materials may be deposited layer by layer until a mold configured to form a photonic bandgap device with the desired structure has been completely built.
>
> ...In preferred arrangements, two thermoplastic polymers may be used. The first thermoplastic polymer, referred to as the build material, may be deposited to build the mold according to the computer generated data. The other thermoplastic polymer, referred to as the support material, may be deposited to temporarily support any undercut regions of the mold during the forming process and to temporarily fill the

> cavities of the mold, i.e., those portions of the mold which are subsequently to be filled with a slurry to form the photonic bandgap device.

(Danforth, col. 25, line 45-64).

It is this slurry that is placed in the mold to form the desired photonic bandgap device that the Office Action construes as the claimed "property enhancing material." (Action of 6/8/07, p. 4). However, this slurry is only used to form the desired photonic bandgap device and has no property enhancing effect on the mold. To the contrary, the mold is destroyed to release the rods produced from the slurry.

> The slurry within the mold was then dried slowly in air at room temperature for 12 hours, followed by oven drying .... The furnace was then shut off and the resultant structure allowed to cool to ambient. This binder removal cycle ***eliminated the mold*** and yielded a periodic latticework of alumina in the desired photonic bandgap structure. The binder burnout cycle also removed the Durmax binder which had been a component of the slurry.

(Danforth, col. 29, line 56 to col. 30, line 5) (*See also,* col. 30, lines 53-57).

Thus, Danforth does not teach or suggest the claimed method including "infiltrating said pores with a property enhancing material that enhances a property of said object."

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present instance, the scope and content of the prior art, as evidenced by Danforth, did not include the claimed method including creating pores using a removable support material during solid freeform fabrication of an object and "infiltrating said pores with a property enhancing material that enhances a property of said object." This subject matter appears to be entirely beyond the scope of the cited prior art.

Moreover, this difference between the cited prior art and the claimed subject matter is extremely significant. As explained in Applicant's specification, the claimed method allows a wide variety of desirable properties of the resulting porous structure to be controlled or changed as best suits a particular application. (Applicant's specification, paragraph 0040). This advantage is apparently unknown and unavailable in the prior art.

For at least these reasons, Danforth cannot support a rejection of claim 7 under 35 U.S.C. § 103(a) and *Graham*. Therefore, the rejection of claim 7 and its dependent claims should be reconsidered and withdrawn.

Additionally, the various dependent claims of claim 7 recite subject matter that is further patentable over Danforth. Specific, non-exclusive examples follow.

Claim 8 recites "wherein said property enhancing material comprises one of a high toughness material, a flexible material, a lubricant, an odorant, a de-odorant, a drug, a colorant, a reactive gas, a reactive liquid, an electrostatic or electromagnetic enhancing material, or an adhesive." As demonstrated above, Danforth merely teaches molding a slurry into a photonic bandgap structure. Danforth does not teach or suggest the subject matter of claim 8. Moreover, the Office Action fails to address how or where Danforth teaches the subject matter of claim 8. For at least these additional reasons, the rejection of claim 8 should be reconsidered and withdrawn.

Similarly, claims 50-60 each depend from claim 7 and recite various property enhancing materials infiltrated into the pores formed in the method of claim 7. These property enhancing materials include, for example, a drug (claim 50), a lubricant (claim 51), an odorant (claim 52), a de-odorant (claim 53), a colorant (claim 54), a reactive gas (claim 55), a reactive liquid (claim 56), an electrostatic or electromagnetic enhancing material (claim 57), an adhesive (claim 58), a flexible material (59) and a structure reinforcing material (claim 60).

As demonstrated above, Danforth merely teaches molding a slurry into a photonic bandgap structure and then destroying the mold used. Danforth does not teach or suggest any of the subject matter of claims 50-60. Moreover, the Office Action fails to address how or where Danforth teaches the subject matter of claims 50-60. For at least these additional reasons, the rejection of claims 50-60 should be reconsidered and withdrawn.

Claims 15-20, 48 and 49 were rejected under 35 U.S.C. § 103(a) over the teachings of U.S. Patent App. Pub. No. 2003/0058605 to Keser ("Keser"). For at least the following reasons, this rejection is respectfully traversed.

Claim 15 recites:

> A method for producing porous structures in a three-dimensional object with solid freeform fabrication comprising:
> *selectively depositing a rapidly solidifying build material in a porous configuration*; and
> coupling said deposits of rapidly solidifying build material to form said three-dimensional object.

(Emphasis added).

In contrast, Keser does not teach or suggest a method that includes "*selectively depositing a rapidly solidifying build material in a porous configuration.*" Rather, Keser teaches laser sintering of a layer of loose powder.

> [0029] The laser 410 generates a precise laser beam to the scanner 420. The scanner 420 guides the laser beam using computer aided design (CAD) and/or manufacturing (CAM) data to sinter the powder rolled by the roller from the powder delivery system 440 to the fabrication powder bed 490. The powder delivery piston 450 moves upward incrementally to supply the powder for the process. The fabrication piston 480 moves downward and/or upward as the porous aluminum is being fabricated. *Since the aluminum powder 495 is sintered, as opposed to melted, it remains porous.*

(Keser, paragraph 0029) (emphasis added).

Consequently, Keser does not teach "selectively depositing" a build material as claimed. Rather, a bulk powder is indiscriminately dispensed with a roller. Moreover, Keser does not teach or suggest "selectively depositing a rapidly solidifying build material *in a porous configuration.*" As noted in paragraph 0029, the porous nature of the product in Keser already exists in the aluminum powder used and is merely preserved during the fabrication process. "Since the aluminum powder 495 is sintered, as opposed to melted, it ***remains*** porous." (Keser, paragraph 0029) (emphasis added). Thus, Keser clearly fails to teach or suggest a method including "selectively depositing a rapidly solidifying build material ***in a porous configuration.***" (emphasis added).

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present instance, the scope and content of the prior art, as evidenced by Keser, did not include the claimed method including "selectively depositing a rapidly solidifying build material in a porous configuration." This subject matter appears to be entirely beyond the scope of the cited prior art.

Moreover, this difference between the cited prior art and the claimed subject matter is extremely significant. As explained in Applicant's specification, the claimed method provides a new technique for producing a product with a desired and controlled porosity. (Applicant's specification, paragraphs 0002 and 0012). This advantage is apparently unknown and unavailable in the prior art.

For at least these reasons, Keser cannot support a rejection of claim 15 under 35 U.S.C. § 103(a) and *Graham*. Therefore, the rejection of claim 15 and its dependent claims should be reconsidered and withdrawn.

Additionally, the various dependent claims of claim 7 recite subject matter that is further patentable over Keser. Specific, non-exclusive examples follow.

Claim 19 recites "wherein said selectively depositing a rapidly solidifying build material in a porous configuration comprises vertically stacking voxels of said rapidly solidifying build material with a high precision material dispenser." As demonstrated above, Keser does not teach or suggest stacking voxels, as claimed, but teaches sintering a loose powder. Consequently, Keser does not teach or suggest the subject matter of claim 19. Moreover, the Office Action fails to indicate how or where Keser teaches the subject matter of claim 19. For at least these additional reasons, the rejection of claim 19 should be reconsidered and withdrawn.

Claim 20 recites "wherein said selectively depositing rapidly solidifying build material in a porous configuration comprises depositing voxels of said rapidly solidifying build material in a planar array." As demonstrated above, Keser does not teach or suggest depositing voxels in a planar array, as claimed, but teaches sintering a loose powder. Consequently, Keser does not teach or suggest the subject matter of claim 20. Moreover, the Office Action fails to indicate how or where Keser teaches the subject matter of claim 20. For at least these additional reasons, the rejection of claim 20 should be reconsidered and withdrawn.

Claims 21-26 and 28 were also rejected as being unpatentable under 35 U.S.C. § 103(a) over U.S. Patent No. 5,997,795 to Danforth et al. ("Danforth"). For at least the following reasons, this rejection is also respectfully traversed.

Claim 21 now recites:

> A method for producing porous structures in a three-dimensional object with solid freeform fabrication comprising:
>
> *forming a plurality of containment structures by selective depositing of a support material with a material dispenser;*
>
> *dispensing bulk build material into said containment structures*; and
>
> removing said containment structures to form pores in said build material; and
>
> *infiltrating said pores with a property enhancing material that enhances a property of said object.*

(Emphasis added).

As demonstrated above with respect to claim 7, Danforth does not teach or suggest "infiltrating said pores with a property enhancing material that enhances a property of said object." For at least this reason, the rejection of claim 21 should be reconsidered and withdrawn.

Additionally, claim 21 recites "forming a plurality of containment structures by selective depositing of a support material with a material dispenser." In contrast, Danforth does not teach or suggest this subject matter. Danforth does not teach or suggest any method that involves "selective" deposition to form "a plurality of containment structures." Moreover, the Office Action fails to address this aspect of claim 21 and does not indicate how or where Danforth is thought to teach this subject matter.

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present instance, the scope and content of the prior art, as evidenced by Danforth, did not include the claimed method including "forming a plurality of containment structures by selective depositing of a support material with a material dispenser;" and "infiltrating said pores with a property enhancing material that enhances a property of said object." This subject matter appears to be entirely beyond the scope of the cited prior art.

Moreover, this difference between the cited prior art and the claimed subject matter is extremely significant. As explained in Applicant's specification, the claimed method provides a new technique in which a desired object can be formed more quickly using containment structures and a bulk build material dispensed indiscriminately into the containment structures. (Applicant's specification, paragraph 0055). This advantage is apparently unknown and unavailable in the prior art.

For at least these reasons, Danforth cannot support a rejection of claim 21 under 35 U.S.C. § 103(a) and *Graham*. Therefore, the rejection of claim 21 and its dependent claims should be reconsidered and withdrawn.

Additionally, the various dependent claims of claim 7 recite subject matter that is further patentable over Danforth. Specific, non-exclusive examples follow.

Claim 22 recites: "wherein said plurality of support material containment structures are formed with a high precision material dispenser." Claim 25 recites: "wherein said dispensing bulk build material comprises dispensing a specified quantity of build material with a low precision material dispenser." In contrast, Danforth does not teach or suggest such distinctions between a high precision material dispenser and a lower precision material dispenser. For at least this additional reason, the rejection of claims 22 and 25 should be reconsidered and withdrawn.

RECEIVED
CENTRAL FAX CENTER
SEP 07 2007

Conclusion:

For the foregoing reasons, the present application is thought to be clearly in condition for allowance. Accordingly, favorable reconsideration of the application in light of these remarks is courteously solicited. If the Examiner has any comments or suggestions which could place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the number listed below.

Respectfully submitted,

DATE: September 7, 2007

Steven L. Nichols
Registration No. 40,326

Steven L. Nichols, Esq.
Managing Partner, Utah Office
Rader Fishman & Grauer PLLC
River Park Corporate Center One
10653 S. River Front Parkway, Suite 150
South Jordan, Utah 84095

(801) 572-8066
(801) 572-7666 (fax)

CERTIFICATE OF TRANSMISSION

I hereby certify that this correspondence is being transmitted to the Patent and Trademark Office facsimile number 571-273-8300 on September 7, 2007. Number of Pages: 26

Rebecca R. Schow